SISU-1004

4-Axis Stepper Interface Module

Operating Instructions and specifications

200006C-01

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This document describes how to use the Sisu Devices SISU-1004 module and includes specifications and pin assignments. This module is meant to be used with the NI RIO product line from National Instruments including cRIO controllers and backplanes. For information and documentation on C-Series modules from National Instruments, visit `ni.com/info` and enter `cseriesdoc`.

Connecting the SISU-1004

The SISU-1004 module provides stepper drive interface signals for 4 axes of motion. These include step, direction, and enable outputs as well as three inputs which are used for forward limit, reverse limit, and drive fault signals.

Pin Assignments

Install the module in the chassis as specified in chassis documentation from National Instruments.

The SISU-1004 has four RJ-45 drive interface receptacles and a four position power connector. Each receptacle of the RJ-45 connector includes command signals for interfacing with stepper drives and three digital input lines that are used for monitoring fault and limit switch inputs. The power connector requires +18V to +30V input power. Refer to **Figure 1** and **Table 1** for the RJ-45 receptacle pin assignments.

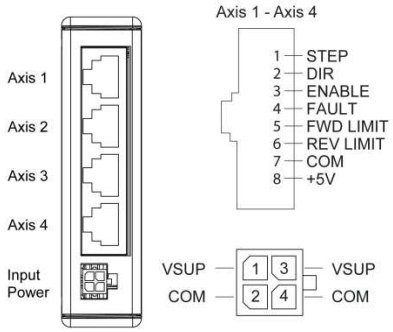


Figure 1. Pin assignments for SISU-1004

RJ45 Connector Axis 1 – Axis 4	
Pin	**Description**
1	Step output
2	Direction output
3	Enable output
4	Fault input
5	Forward limit input
6	Reverse limit input
7	Common
8	+5V regulated output source
Power Input Connector	
1	External power supply source (+18V to +30V)
2	External power supply common
3	External power supply source (+18V to +30V)
4	External power supply common

Table 1. Pin assignments for SISU-1004

Refer to the *Specifications* section for more details on signal electrical requirements.

Note: The SISU-1004 requires an external power supply. Connection to the external power supply is through the V_{sup} input provided on the four position power connector. Do not connect more than one external power supply to the module.

Sisu Devices recommends using shielded cables from the RJ45 connectors on the SISU-1004 module to the motion drives. Cables can be connected from the SISU-1004 to a RJ45 breakout accessory (**Figure 2**) and then wired to a motion drive.

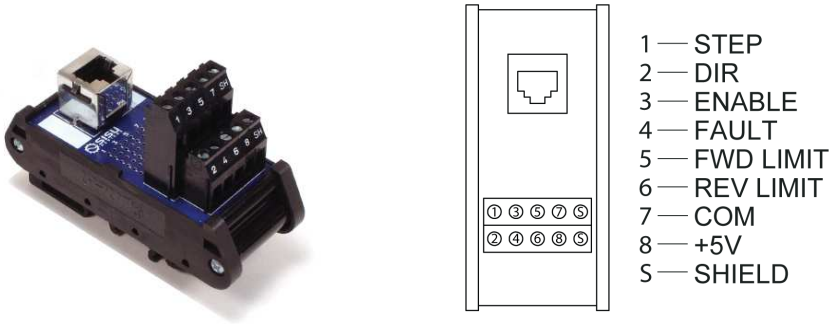


Figure 2. RJ45 breakout accessory for SISU-1004

Note: The SISU-1004 can be connected to non-stepper motion drives that support step and direction inputs as long as they meet electrical requirements detailed in the *Specifications* section (i.e. digital servo drives and piezo motion drives).

Signal Connections

Figure 3 shows the SISU-1004 block diagram:

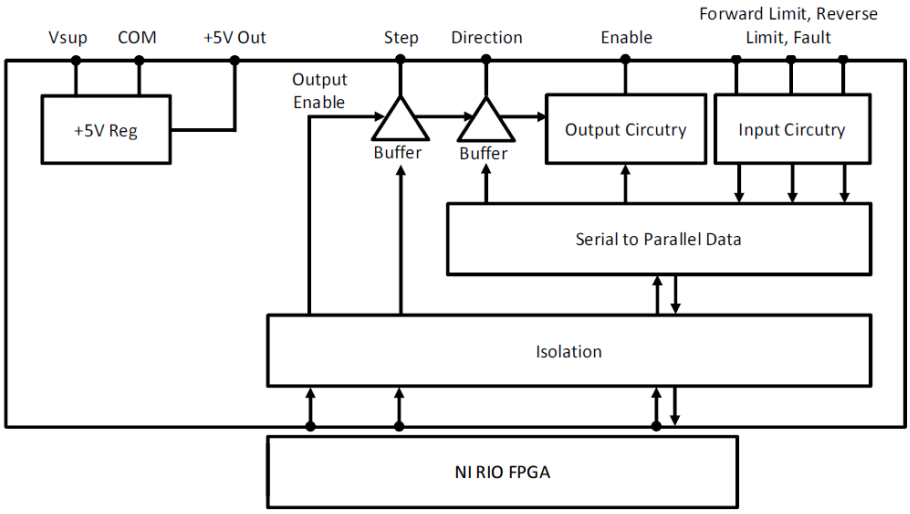


Figure 3. SISU-1004 Block Diagram

Step and Direction outputs of the SISU-1004 can source and sink. For drives with opto-isolated inputs as shown in **Figure 4,** it is recommended to connect the SISU-1004 Step and Direction terminals as sinking outputs. The Step output connects to the negative or cathode side of the drive optocoupler input and the +5V output connects to the positive or anode side of the drive input.

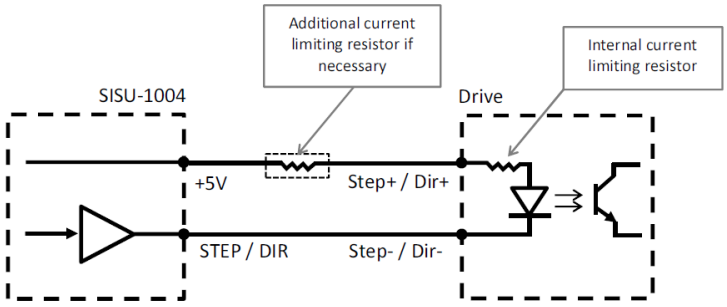


Figure 4. Step and Direction Output Connection

Note: The SISU-1004 Step and Direction outputs must be current limited to 16mA or less as detailed in the *Specifications* section. This corresponds to a current limiting resistor of about 330 ohms or more. If the drive does not have internal current limiting circuitry or has a current limiting resistor with a value less than 330 ohms, an additional resistor must be placed in line with each of the +5V and Step+ / Dir+ connections. Failure to do so can damage the SISU-1004 module and drive electronics.

The SISU-1004 Drive Enable is a sinking output that is compatible with most 5V and 24V drive enable circuitry. **Figure 5** illustrates connections to a drive with an opto-isolated enable input. **Figure 6** illustrates connections to a drive with other types of inputs.

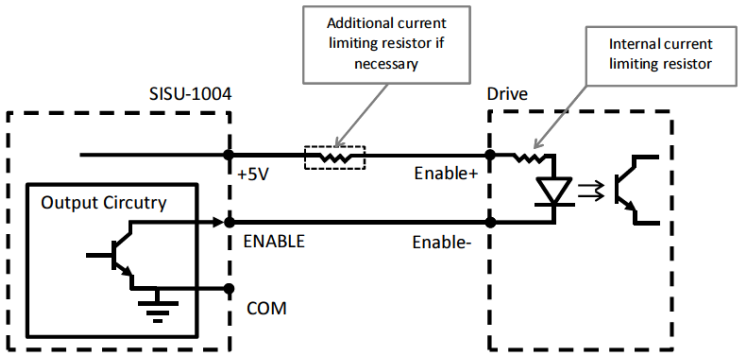


Figure 5. Enable output connection for opto-isolated drive inputs

Note: The SISU-1004 Enable output must be current limited to 16mA or less as detailed in the *Specifications* section. This corresponds to a current limiting resistor of about 330 ohms or more. If the drive does not have internal current limiting circuitry or has a current limiting resistor with a value less than 330 ohms, an additional resistor must be placed in line with each of the +5V and Enable+. Failure to do so can damage the SISU-1004 module and drive electronics.

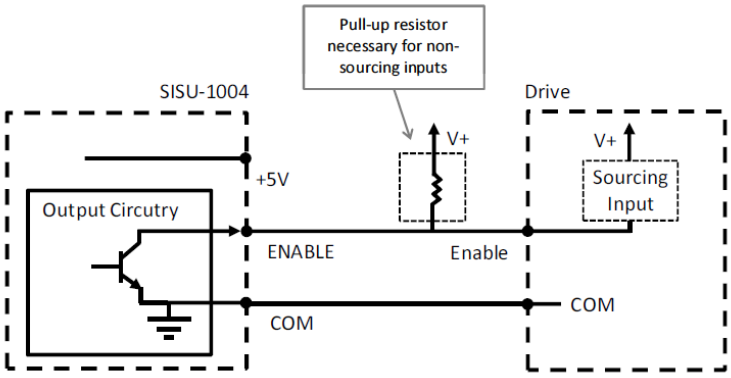


Figure 6. Enable output connection for other types of drive inputs

Note: The SISU-1004 Enable output must be current limited to 16mA or less as detailed in the *Specifications* section. Failure to do so can damage the SISU-1004 module and drive electronics. For opto-isolated drive inputs the total current limiting resistance should be about 330 ohms or greater. For non-sourcing drive enable inputs a pull-up resistor is required. Depending on the drive enable voltage requirements this pull-up resistor can be connected to the +5V output of the SISU-1004 or to a different higher voltage source if necessary. If connected to the +5V output of the SISU-1004 use a

resistor in the range of 330 ohms to 1K ohms thereby limiting current draw to the +5V output to less than 16mA.

Forward Limit, Reverse Limit, and Fault inputs are sinking inputs and should be connected to sourcing devices. **Figure 7** illustrates connections to a PNP or switched output. For Forward Limit and Reverse Limit inputs, 11V to 30V will be registered as active high. For Fault inputs, 1.5V to 30V will be registered as active high. See the *Specifications* section for more details.

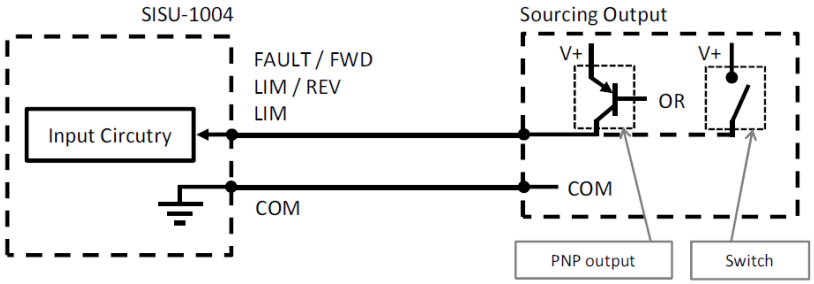
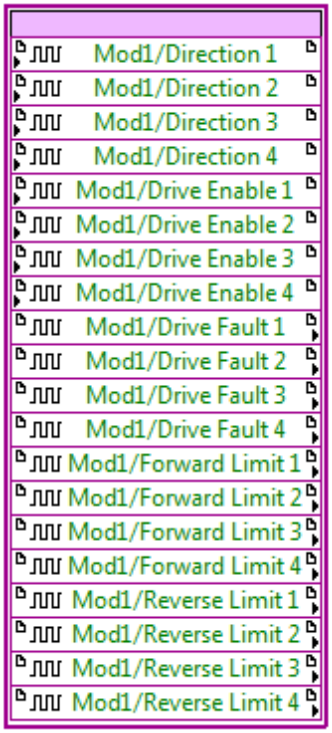


Figure 7. Forward Limit, Reverse Limit, and Fault input connections

LabVIEW FPGA Driver

The SISU-1004 is provided with a LabVIEW FPGA driver available on sisudevices.com for download. Below is a summary of the data available to the user.



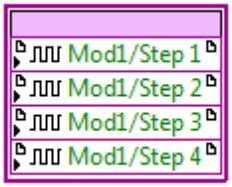
This I/O node writes Direction and drive Enable outputs, and reads the Fault, Forward Limit, and Reverse Limit inputs. It is recommended to keep all this I/O in a single node to reduce communication time and jitter.

Direction: writing a value of True will set the corresponding DIR output high (source); writing a value of False will set the DIR output low (sink). The "Set Output Enable" method must be set True otherwise the outputs will be in a tri-stated high-impedance mode.

Drive Enable: writing a value of True will set the ENABLE output low (sink). This output is sinking only. The "Set Output Enable" method must be set True otherwise the outputs will be disabled.

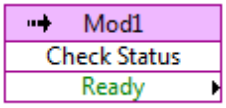
Input Data (fault, forward limit, and reverse limit): reading input values will result in True when the input voltage is high and False when the input voltage is low. See the *Specifications* section for details on the threshold levels for the different inputs. If the "Set Output Enable" method is False, all inputs will be read as True. If the module is removed from a CompactRIO chassis or if external power is not applied to module all inputs will be read as True.

Not compatible with FPGA SCTL (Single Cycle Timed Loop)



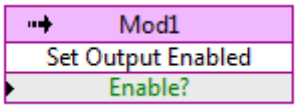
Writing to this I/O node sets the output of the STEP signal. A value of True will drive the STEP output high (source); a value of False will drive the output low (sink). The "Set Output Enable" method must be set True otherwise the outputs will be in a tri-stated high-impedance mode.

Compatible with FPGA SCTL (Single Cycle Timed Loop)



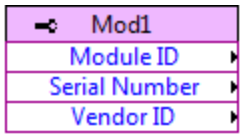
The “Check Status” method node checks if the driver is ready. Ready is True when the driver has initialized and output states are valid. The "Set Output Enable" method must be set True for Ready to be True. Setting the "Set Output Enable" method False will cause Ready to be False. If the module is removed from a CompactRIO chassis or if an incorrect module is inserted into the CompactRIO chassis slot Ready will read False.

Not compatible with FPGA SCTL (Single Cycle Timed Loop)



Calling the “Set Output Enabled” method node enables the module output lines. Output lines are high impedance and inputs (Fault, Forward Limit, and Reverse Limit) for all axes are True when "Enable?" is set False.

Not compatible with FPGA SCTL (Single Cycle Timed Loop)



This property node reads the Module ID, Serial Number, and Vendor ID of the module.

Not compatible with FPGA SCTL (Single Cycle Timed Loop)

Specifications

The following specifications are typical for the range -40°C to 70°C unless otherwise noted. All voltages are relative to COM unless otherwise noted.

Motion Command Signals

Step and Direction outputs	
Output type	Single ended 3-state sinking or sourcing buffer (high-impedance when disabled)
Step pulse rate	2 MHz (maximum)
Continuous output current on each channel	±16 mA (maximum)
Output voltage	5.25 V (maximum sinking or sourcing)
Step pulse width	250 ns (minimum)
Direction state update	< 25 µs
Output mode	Step and direction
Drive enable output	
Output type	Sinking
Voltage range	0 to 30 V
Continuous output current on each channel	16 mA max
Enable state update	25 µs min

Motion I/O

Forward and reverse inputs	
Input type	Sinking
Digital logic level, OFF state	≤5 V
Digital logic level, ON state	11 to 30 V
Input impedance	26.7 kΩ ±5%
Pulse width	25 µs (minimum)
Fault input	
Input type	Sinking
Digital logic level, OFF state	≤0.8 V
Digital logic level, ON state	1.5 to 30 V
Input impedance	22 kΩ ±5%
Pulse width	25 µs (minimum)
5 V regulated output	
Output voltage	5 V ±5%
Continuous output current on each channel	50 mA (200 mA max all channels)

Power Requirements

Power consumption from chassis	
Active mode	200 mW max
Sleep mode	Not supported
Thermal dissipation (at 70 °C)	
Active mode	1.5 W max
V_{sup} input	18 to 30 V, 200 mA max

Shock and Vibration

Operating vibration	
Random (IEC 60068-2-64)	5 grms, 10 to 500 Hz
Sinusoidal (IEC 60068-2-6)	5 g, 10 to 500 Hz
Operating shock (IEC 60068-2-27)	30 g, 11 ms half sine, 50 g, 3 ms half sine, 18 shocks at 6 orientations

Environmental

The SISU-1004 is intended for indoor use only, but may be used outdoors if installed in a suitable enclosure. Refer to the manual for the chassis you are using for more information about meeting these specifications.

Operating temperature	–40 to 70 °C
Storage temperature	–40 to 85 °C
Ingress protection	IP 40
Operating humidity	10 to 90% RH, non-condensing
Storage humidity	5 to 95% RH, non-condensing

Physical Characteristics

If you need to clean the module, wipe it with a dry towel.

Approximate Outside Dimensions	76.2mm x 88.9mm x 22.9mm (3.00” x 3.50”x0.90”)
Weight	152 g (5.4 oz)

Note: For two-dimensional drawings and three-dimensional models of the C Series module and connectors, send a request to info@sisudevices.com.

Safety Guidelines

Operate the SISU-1004 only as described in these operating instructions. The safety guidelines and specifications in this document are specific to the SISU-1004. The other components in the system may not meet the same safety ratings and specifications. Refer to the documentation for each component in the system to determine the safety ratings and specifications for the entire system.

Compliance

Waste Electrical and Electronic Equipment (WEEE)

EU Customers: At the end of the product life cycle, all products *must* be sent to a WEEE recycling center.

CE Compliance CE

The standards used to demonstrate compliance to the EMC directive are: EN 61326-1: 2006.

The device was tested utilizing the following documents and found to be in compliance with the required criteria:

EN 61326-1: 2006	
Radiated Emissions	
CISPR 11: 2003	Group1, Class A
Immunity	
IEC 61000-4-2: 2001	4kV/8kV,Criteria A
IEC 61000-4-3: 2002	80MHz-1GHz, 10V/m, Criteria A 1.4GHz-2GHz, 3V/m, Criteria A 2GHz-2.7GHz, 1V/m, Criteria A
IEC 61000-4-4: 2004	DC Power: 2kV, Criteria B; I/O Line: 1kV, Criteria A
IEC 61000-4-5: 2001	DC Power: 1kV-LL/2kV-LE, Criteria C* I/O Line: not required**
IEC 61000-4-6: 2003	DC Power & I/O Line: 3Vrms, Criteria A
IEC 61000-4-8: 1993	30A/m, 50Hz, Criteria A

*DC Power Surge testing is not required due to EUT not connected to a DC Distribution network
** I/O Line Surge testing not required due to I/O lines do not run long distance outside of the building.

用户须知 Sisu Devices 中华人民共和国产品信息
http://www.sisudevices.com/downloads/Sisu_Devices_China_RoHS_200110A-01.pdf

Where to Go for Support

Product information is available on the Sisu Devices website (sisudevices.com). For additional support, Contact Sisu Devices:

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